



US006797191B2

(12) **United States Patent**
Philips et al.

(10) Patent No.: **US 6,797,191 B2**
(45) Date of Patent: **Sep. 28, 2004**

(54) **EFFICIENT SNOWMAKING WITH
POLYMER DRAG REDUCTION**

(75) Inventors: **Richard B. Philips**, Barrington, RI
(US); **Theresa A. Baus**, Warren, RI
(US)

(73) Assignee: **The United States of America as
represented by the Secretary of the
Navy**, Washington, DC (US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 166 days.

(21) Appl. No.: **10/090,987**

(22) Filed: **Feb. 28, 2002**

(65) **Prior Publication Data**

US 2003/0162865 A1 Aug. 28, 2003

(51) Int. Cl.⁷ **C09K 3/00**

(52) U.S. Cl. **252/1; 62/66; 62/68; 62/74;
239/2.2**

(58) Field of Search **252/1; 62/66, 68,
62/74; 239/2.2**

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,265,650 A * 8/1966 Kerr 524/322

5,660,935 A * 8/1997 Kambayashi et al. 428/405
5,886,083 A * 3/1999 Mackey 524/503
6,116,515 A * 9/2000 Chelminski 239/2.2
6,464,148 B1 * 10/2002 Costa et al. 239/2.2
6,466,870 B2 * 10/2002 Satonaka 701/213

* cited by examiner

Primary Examiner—Cephia D. Toomer

(74) *Attorney, Agent, or Firm*—James M. Kasischke;
Michael F. Oglo; Jean-Paul A. Nasser

(57) **ABSTRACT**

A method for reducing the drag on an aqueous solution in a pipe or hose system such as a snow making system includes the introduction of drag reducing polymers into the aqueous solution prior to circulating the solution in a pipe or hose. In a preferred embodiment, the drag reducing polymers are a mixture of polyethylene oxide in a carrier solution. The introduction of the polyethylene oxide in a carrier solution reduces the overall frictional drag and therefore increases the snow making efficiency by reducing the power needed to pump the water. As a result, it is easier for greater quantities of snow to be made using existing equipment due to the increased flow rate as a result of the lower drag friction. In a preferred embodiment, the polyethylene oxide is approximately 20–30% by weight and is introduced into the water pipe so resulting concentrations are approximately 30–100 weight parts per million (WPPM).

8 Claims, 2 Drawing Sheets

